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(71) Applicants  
Jose Prat Abel,  
Avenida Diagonal,  
No. 489,  
Barcelona,  
Spain,  
Adolfo Azoy Sabata,  
Avenida Diagonal,  
No. 489,  
Barcelona,  
Spain,  
Emilio Lluch Alsina,  
Avenida Diagonal,  
No. 489,  
Barcelona,  
Spain

(72) Inventors  
Jose Prat Abel,  
Adolfo Azoy Sabata,  
Emilio Lluch Alsina

(74) Agent and/or address for  
service  
Marks & Clerk,  
57—60, Lincoln's Inn  
Fields,  
London,  
WC2A 3LS

## (54) Defrosting indicator

(57) A transparent outer container 1 accommodates an inner container 2 containing a coloured liquid substance 3 which, on freezing, expands to a sufficient extent to break the wall of the inner container 2. The container 2 is enclosed within first and second

layers 4, 6 of capillary material which extend between two fibre pads 7. A non-permeable opaque layer 5 prevents the liquid being visible when the substance freezes and breaks the container 2. When defrosting occurs, the coloured substance 3 flows in liquids form via the pads 7 to the second capillary layer 6 where it is visible.

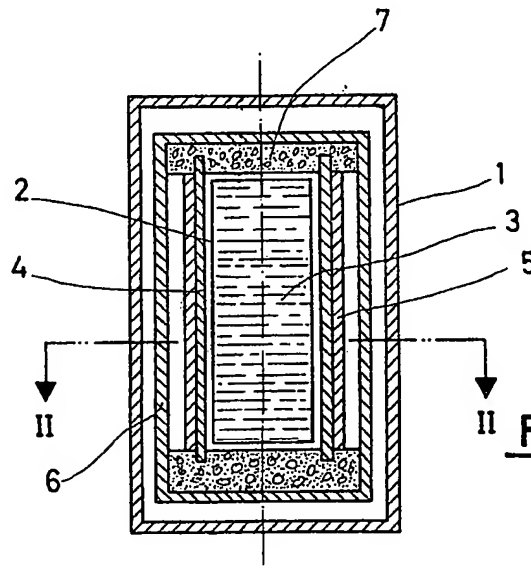
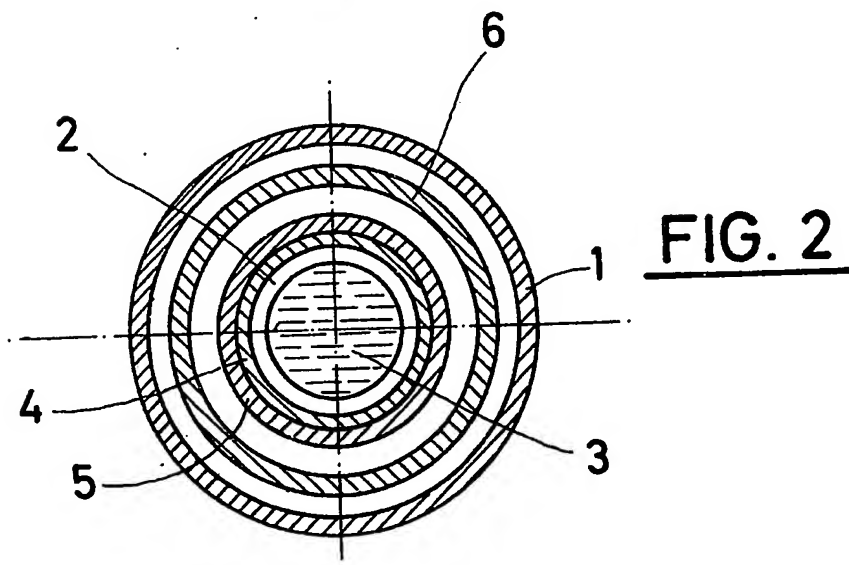
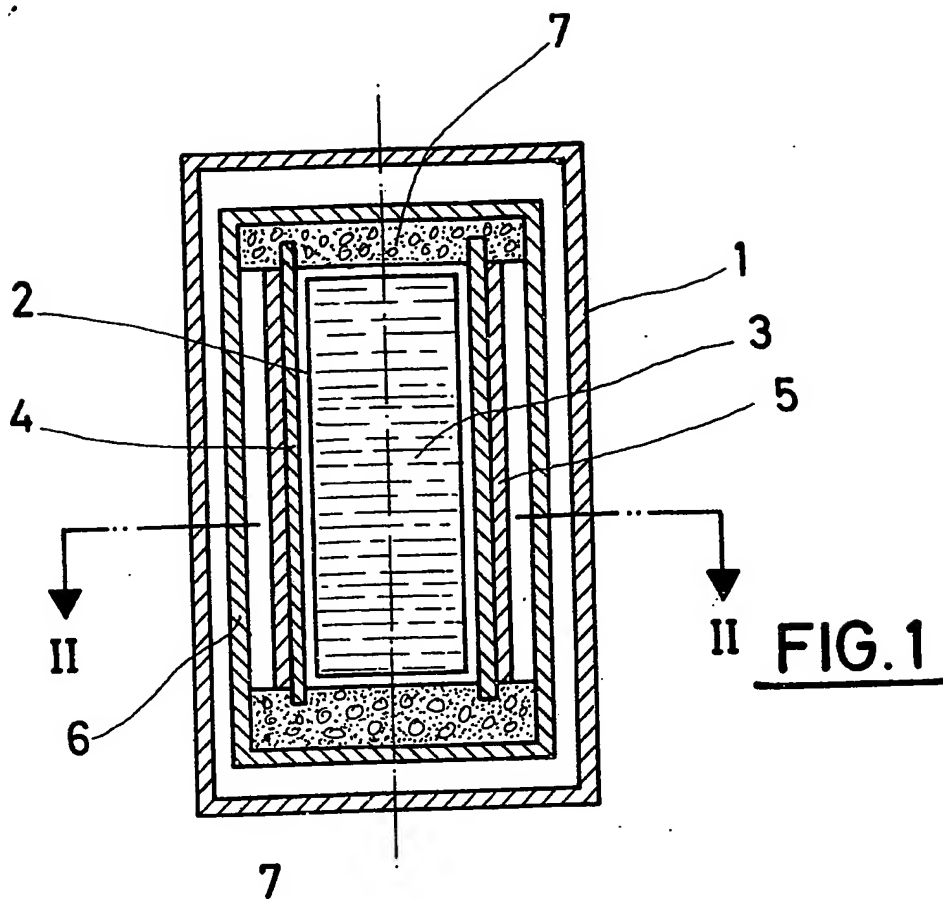


FIG. 1

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## SPECIFICATION

### Defrosting indicator

The present invention relates to a defrosting indicator for indicating if the temperature in a refrigerated environment (e.g. a freezing compartment for food products) has exceeded a given level.

It is known that refrigeration is one of the most suitable processes for protecting foods from deterioration caused by microbes, enzymes, or auto-oxidation, and it is even more efficient at temperatures below freezing temperature, as harmful bacteria are hardly able to develop at these low temperatures. Thus the efficiency of freezing for conserving products which are intended to be eaten and can be stored in this manner for a long time in refrigerators is evident and widely known.

However, freezing entails the serious disadvantage that if it is interrupted at a given moment, for a period which is prolonged to a greater or lesser extent, the favourable conditions for the food are disturbed, without this interruption being detected by any means which informs the consumer that a malfunction has occurred.

What is desired is a device which provides an irreversible indication which warns the consumer of the temporary partial or total defrosting which has occurred.

The present invention provides a defrosting indicator comprising an inner container containing a coloured substance which is liquid at ambient temperature and which expands on freezing to a sufficient extent to fracture the inner container; covering means surrounding the inner container, so that it is not visible, the covering means comprising liquid permeable material and providing a path to the outside of the covering means for coloured liquid escaping from the inner container when the freezing point of the coloured substance is exceeded; and an outer container which contains the inner container and the covering means and is wholly or partly transparent.

The indicator can be handled without freezing at ambient temperatures and follows the freezing process of the food or product to be protected, a disturbance in the refrigeration process being detected by this device, whose outward appearance undergoes an irreversible colour change. This colour change persists in spite of the fact that the freezing process resumes again and the food once again reaches a suitable freezing temperature. It should be appreciated that defrosting of a product does not occur at a specific temperature but when the product is at a temperature greater than the maximum admissible, which will normally be a temperature below freezing temperature (0°C) although in exceptional cases this could be above freezing temperature.

One of the important features of this indicator is its ability to detect irreversibly the specific

defrosting of each product at different degrees, by using coloured liquids having different freezing points.

The invention will be described further, by way of example with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal section through a defrosting indicator; and

Figure 2 is a transverse section along line II—II in Figure 1.

The defrosting indicating, for use in a freezing process for products which are preferably foodstuffs, provides an irreversible indication and comprises an outer container or receptacle 1 made wholly or partly of transparent material, in the interior of which there is an inner container 2 filled with a coloured liquid substance 3 which, when it freezes, increases in volume, thereby producing a break in the wall of the inner container 2.

The inner container 2 has an external capillary covering 4 which surrounds its lateral face; an opaque protective covering 5 which is neither capillary nor permeable and surrounds the former; and a receptacle 6, of capillary material, which contains the just-described assembly.

Between the ends of the receptacle 6 and the ends of the container 2 there are disposed two fibre-pads 7, which *inter alia* have the function of acting as cushioning and positioning means for the inner container 2 when the indicator is being manipulated.

When the indicator is included in the freezing process of the food or product to be protected, the coloured substance 3 freezes, the increase in volume causing the container 2 to break.

The capillary covering 4 and protective covering 5 prevent any part of the frozen coloured substance 3 being accidentally visible from the exterior and thus producing a false indication.

When defrosting occurs as a result of any malfunction of the refrigeration process, the substance 3 becomes liquid, flowing through the capillary coverings 4, 6 and making itself visible owing to the transparent nature of the outer container 1.

The defrosting indicator may be constructed in any shape and size using the most suitable materials.

### Claims

1. A defrosting indicator comprising an inner container containing a coloured substance which is liquid at ambient temperature and which expands on freezing to a sufficient extent to fracture the inner container; covering means surrounding the inner container so that it is not visible, the covering means comprising liquid permeable material and providing a path to the outside of the covering means for coloured liquid escaping from the inner container when the freezing point of the coloured substance is exceeded; and an outer container which contains the inner container and the covering means and is wholly or partly transparent.

2. A defrosting indicator as claimed in claim 1,  
in which the covering means comprises fibre pads  
at opposite ends of the inner container, a layer of  
capillary material extending from one fibre pad to  
the other and surrounding the inner container,  
and a non-permeable layer surrounding the  
capillary layer between the pads.

3. A defrosting indicator as claimed in claim 2,  
in which the covering means further comprises a  
receptacle of capillary material surrounding the  
fibre pads and the non-permeable layer.

4. A defrosting indicator substantially as  
described with reference to, and as shown in, the  
accompanying drawings.

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